

ON THREE NEW *EPISTYLIS* FROM THE FRESH WATER
MUSSEL, *ANODONTA LAUTA* V. MARTENS

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ONE PLATE and FOUR FIGURES

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I have been collecting the fresh water mussel, *Anodonta lauta* v. Martens in order to study the associated *Conchophthirus*, and I found an abundance of vorticellan colonies along the margins, upon the surfaces of the shells and in the gills of the mussels. I have made observations on these vorticellan colonies, and it is the purpose of this paper to give a description of their species. These species are *Epistylis wenrichi* sp. nov., *Ep. longicorpora* sp. nov., and *Ep. anodontae* sp. nov.

All the hosts, *Anodonta lauta* v. Marten, were collected from the ditches in the suburbs of the city of Kawaguti, Saitama Prefecture. The observations were generally made on the living organisms, but cytological details were investigated with prepared materials, which had been fixed with Schaudinn's fluid and stained with Heidenhain's haematoxylin.

In publishing this paper, I wish to express my hearty thanks to Professor Dr. Yaichiro Okada, Zoological Laboratory of Tokyo Higher Normal School, for his valuable advice and kind guidance. And also I would acknowledge my indebtedness to Prof. Dr. D. H. Wenrich, Zoological Laboratory of University of Pennsylvania, U.S.A., for his useful suggestions on my identification of the species and for his kind corrections in the wording and grammar of this paper.

1. *Epistylis wenrichi* sp. nov. (Pl. 5, Figs. 1, 2; Textfig. 1)

Colonies of this species occur abundantly along the margins and upon the surfaces of the shells of *Anodonta lauta* v. Martens, looking like mildew to the naked eye. The height of the colony measures 7-8 m.m. on the average.

The colonial stalk is ramified dichotomously, and bears an individual zooid at each terminal end. We can clearly observe several annulated rings on its external pellicle and a fibrillar structure in the center of its stalk. The stalk frequently bears the collared flagellate, *Monosiga steinii* Kent, and individuals of the suctorian, *Tokophrya quadripartita* (Cl.-Lach.), as well as other microorganisms, or it may be covered with mucous, and muddy substances, which sometimes form a sheath for the stalk.

When fully extended, the individual zooid is elongate-conical, its length being three times its breadth and it tapers to its point of junction with the stalk; the ciliated oral disc is elevated obliquely; the peristomal border is rather thick, considerably everted; when contracted, usually the zooid is thrown into transverse folds posteriorly but sometimes shows a transverse marking for the whole length, and bears a longitudinally plicate, snout-like projection in front. But the stalk does not contract, therefore individual zooids contract independently.

The measurement of the extended and living organisms gave the following dimensions:

Length of body: 180 (165–200) μ

Width of body: 62 (53–70) μ

Diameter of the stalk: 16 (15–18) μ

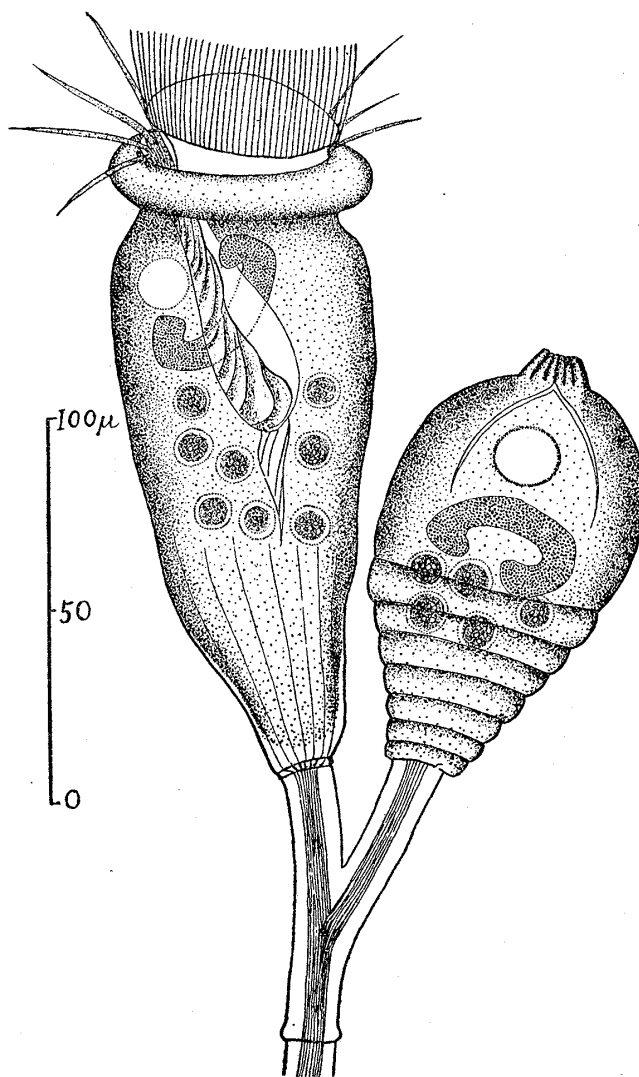


Fig. 1. *Epistylis wenrichi* sp. nov.

The vestibule is large with an undulating membrane, the cytopharynx being well developed, extending as far as the middle portion of the body. The endoplasmic granules are rather large and packed close together in the body, so that we can hardly recognize the macronucleus in the living organism. Several of the food vacuoles were tinted greenish or yellowish, with bacteria, amoebocytes of the mussel, *gonium* and other microorganisms, and were found scattered among the endoplasmic granules of the body. The Macronucleus being horse-shoe-shaped, consists of various sizes of chromatin granules and is located anteriorly. A contractile vacuole, single, is placed very close to the wall of the vestibule at the anterior end.

Binary fission occurs frequently from early spring to summer. At the beginning of division, the body grows wider and becomes equal to or somewhat greater than the length. Then a longitudinal slit appears in the median line of the body and at last the body divides into two individuals. But, about the division of the body I shall give details at another time.

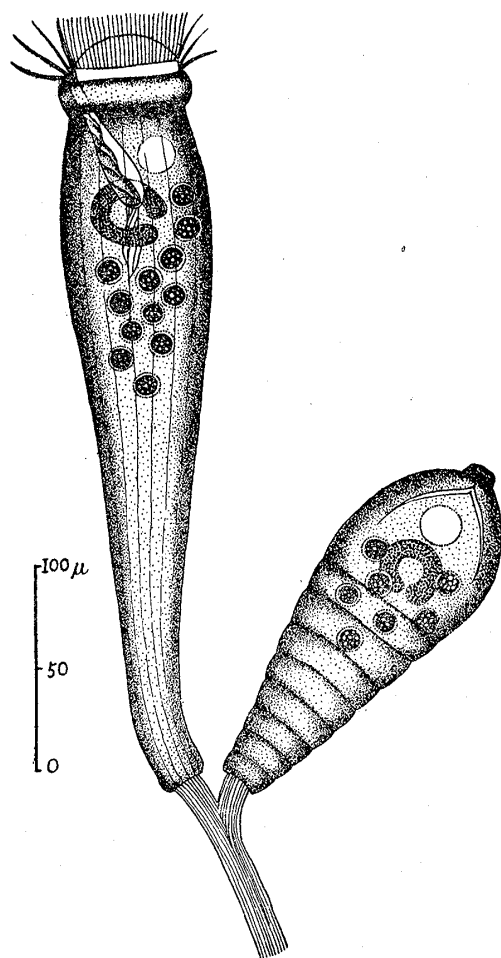


Fig. 2. *Epistylis longicorpora* sp. nov.

It is clear from the above descriptions that this animal belongs to the genus *Epistylis*. It rather resembles *Ep. rotans* Sevec and *Ep. nympharum* Engelmann, but it may be distinguished from the latter by (1) the appearance and distribution of the striations upon the pellicle of the stalk, (2) the high elevation of the oral disc and the shape of the anterior portion of the zooid when fully extended. So that I think this animal is new to science, and I shall name it *Ep. wenrichi* as a tribute to Prof. Dr. D. H. Wenrich for his kind and valuable suggestions on my work.

2. *Epistylis longicorpora* sp. nov.
(Pl. 5, Figs. 1, 3; Textfig. 2)

This species is found mixed

with the above mentioned *Epistylis wenrichi* along the margins and upon the surface of the shells of *Anodonta lauta* v. Martens. The height of the colonies measured 2-3 m.m. on the average.

The stalk, dichotomously branched, often corymbose, is frequently covered with a gelatinous substance or bears the collared flagellate, *Monosiga steinii* Kent, and individuals of the suctorian, *Tokophrya quadripartita* (Cl.-Lach.), just as in the case of *Epistylis wenrichi*. There are no annulated rings on the pellicle.

When fully extended, the body of the zooid is very elongate-conical, its length being four or five times its breadth; the ciliated oral disc is considerably elevated; the peristomal border rather thick, turning outwards, and just below it there is usually a constriction, forming a narrow groove. When contracted, there appear transverse folds throughout the surface of the body and a snout-like projection in front. The stalk never contracts, so that the contraction of the zooids takes place independently.

The measurement of the living and extended organisms gave the following dimensions:

Length of body: 387 (350-429) μ

Width of body: 75 (53-96) μ

Diameter of the stalk: 19 (16-24) μ

The vestibule is large with an undulating membrane, and the cytopharynx is well developed. As the endoplasmic granules are very delicate, the macronucleus and food vacuoles are seen conspicuously in the living organisms. The macronucleus, being horse-shoe-shaped, consists of various sizes of chromatin granules. The single contractile vacuole is located anteriorly.

This animal rather resembles *Ep. plicatilis* Ehr., but it may be easily distinguished from the latter in certain points, such as the size of the zooids, the shape of the peristomal border and the location of the contractile vacuole; Therefore this animal is new to science, and I shall call it *Ep. longicorpora* because of the great length of its body.

3. *Epistylis anodontae* sp. nov. (Pl. 5, Fig. 4; Textfigs. 3, 4)

This animal is always found, in colonies, in the gills of mussels, *Anodonta lauta* v. Martens. Each colony is composed of usually from four to eight individuals, but rarely sixteen individuals or so.

The stalk is dichotomously branched like the preceding two species, but because of their short branches all the individuals are

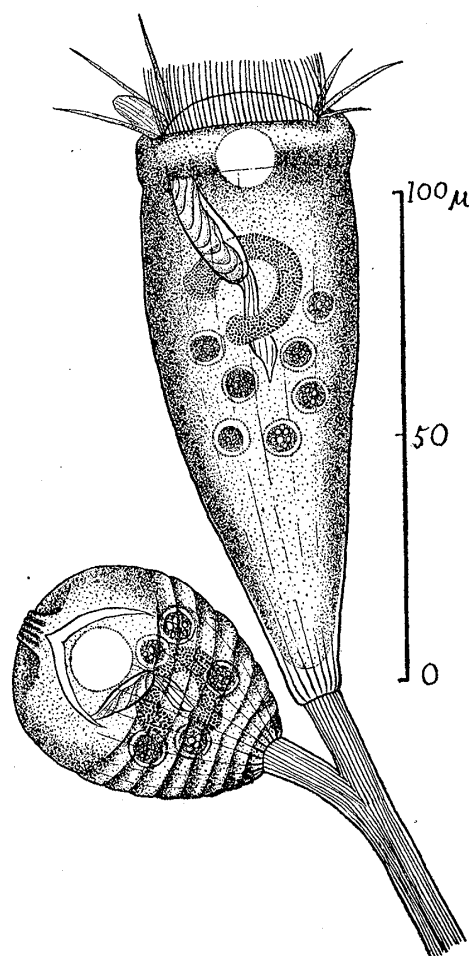


Fig. 3. *Epistylis anodontae* sp. nov.

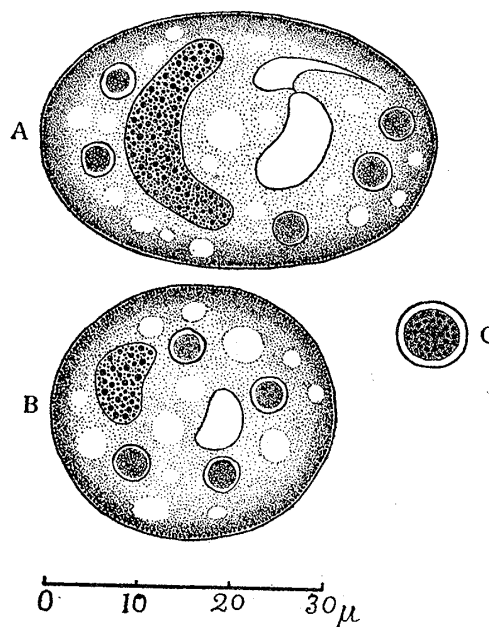


Fig. 4. A and B, transverse section of the body of *Epistylis anodontae* sp. nov.; A, through the anterior portion and B, through the middle portion of the body. C, transverse section of the stalk of *Epistylis anodontae* sp. nov.

closely crowded. The stalk is made up of a bundle of fibers within the surrounding pellicle. Although this structure of the stalk is observed in living organism, it is more clearly observed in cross-sectioned materials.

When fully extended, the body is elongate-conical, its length being about three times its breadth, tapering posteriorly; the oral disc slightly elevated, peristomal border narrow and everting a little, a very transparent and fairly large undulating membrane projecting out of the peristome, a slight constriction just beneath the peristomal border. Judging from the materials of the cross-section preparations the anterior portion of the body is somewhat elliptical, and from about the middle portion to the posterior end, the body is round. In the periphery of the body the myonemes are distributed uniformly. When contracted, the body becomes ovoid, exhibiting slight transverse folds and a small snout-like projection in front. The stalk never contracts,

so that the contraction of the zooids takes place independently.

The measurement of living and extended organisms gave the following dimensions:

Length of body: 125 (105–147) μ

Width of body: 42 (36–48) μ

Diameter of the stalk: 6 (5–7) μ

Vestibule and cytopharynx are well developed. Endoplasmic granules are so delicate that several food vacuoles and a horse-shoe-shaped macronucleus are seen conspicuously in the living organisms. In stained preparations the macronucleus is seen to consist of various sizes of chromatin granules. A contractile vacuole is located near the anterior end of the body.

It is clear from the above description that this animal belongs to the genus *Epistylis*. And although it resembles *Ep. urceolata* Stiller, *Ep. plicatilis* Ehrenberg, *Ep. vaginula* Stein, *Ep. autumnalis* Stokes and *Ep. anastica* Linné very closely in the general form of the body, it may be distinguished from the latter by (1) the oral disc not being so highly elevated, (2) a fairly large undulating membrane projecting out of the peristome, (3) the absence of the transverse striations upon the surface of the body and (4) the shape of the posterior portion of the body when contracted. So that, I think this animal is new to science. I shall call this animal *Epistylis anodontae*, because it parasitizes *Anodonta lauta* v. Martens.

OCCURRENCE

As already mentioned above, *Epistylis wenrichi* and *Ep. longicorpora* are attached to the margins and surfaces of the shells of *Anodonta lauta* v. Martens. A colony of these two species can be readily recognized with the naked eye. We can find the mussels bearing these two species all through the year, sometimes in large numbers, but at other times very few. So, from last year, I kept records of the proportion of the mussels bearing these *Epistylis*, with the dates of their collection. The results are as follows:

Dates of the collection of the mussels	No. of the collected mussels	No. of the mussels bearing <i>Epistylis</i>	% of the occurrence of <i>Epistylis</i>
July 8th, 1936	38	28	74
July 20th, 1936	38	31	91
January 17th, 1937	49	23	46
February 11th, 1937	50	27	54
March 4th, 1937	34	22	65
April 10th, 1937	46	30	65

The occurrence of *Epistylis wenrichi* and *Ep. longicorpora* is more abundant in summer than in winter, and therefore it may be said that the occurrence of these two species of *Epistylis* attached to the mussels depends chiefly upon the temperature of the water in which they live.

On the other hand *Epistylis anodontae* sp. nov. is always found in the gills of *Anodonta lauta* v. Martens in any season of the year. Probably it is because the animal is protected from the external environment by the shells.

DIAGNOSIS:

Epistylis wenrichi sp. nov.

Body of the zooid elongated conical, tapering posteriorly. Average length $180\ \mu$, width about one-third the length. Oral disc obliquely elevated; the peristomal border rather thick, considerably everted. When contracted, there appear transverse folds throughout the surface of the body and a snout-like projection in front. Endoplasmic granules rather large, horse-shoe-shaped macronucleus. The external pellicle of the stalk shows annulated rings. Colonial, the height of the colony being 7–8 m.m. on the average.

Epistylis longicorpora sp. nov.

Body very elongated conical. Average length $387\ \mu$, width about one-fourth or one-fifth the length. Oral disc considerably elevated, the peristomal border rather thick, and just below it a constriction, forming a narrow groove. When contracted, there appear transverse folds throughout the surface of the body and a snout-like projection in front. Endoplasmic granules very delicate, the macronucleus horse-shoe-shaped. Colonial, the height of the colony being 2–3 m.m. on the average.

Epistylis anodontae sp. nov.

Body elongated conical, tapering posteriorly. Average length $125\ \mu$, width about one-third the length. Oral disc slightly elevated, peristomal border narrow and everting a little, fairly large undulating membrane projecting out of the peristome, slight constriction just beneath the peristomal border. When contracted, the body becomes ovoid, exhibiting slight transverse folds and a snout-like projection in front. Stalk not contractile. Colonial, usually made up of 4–8 individuals.

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EXPLANATION OF THE PLATE

- Fig. 1. Shell of the *Anodonta lauta* v. Martens bearing the various *Epistylis* colonies.
- Fig. 2. *Epistylis wenrichi* sp. nov., a microphotograph from the living organisms. ($\times 80$).
- Fig. 3. *Epistylis longicorpora* sp. nov., a microphotograph from the living organisms. ($\times 60$).
- Fig. 4. *Epistylis anodontae* sp. nov., a microphotograph from the prepared materials, which had been fixed with Schaudinn's fluid and stained with Heidenhain's haematoxylin. ($\times 180$).

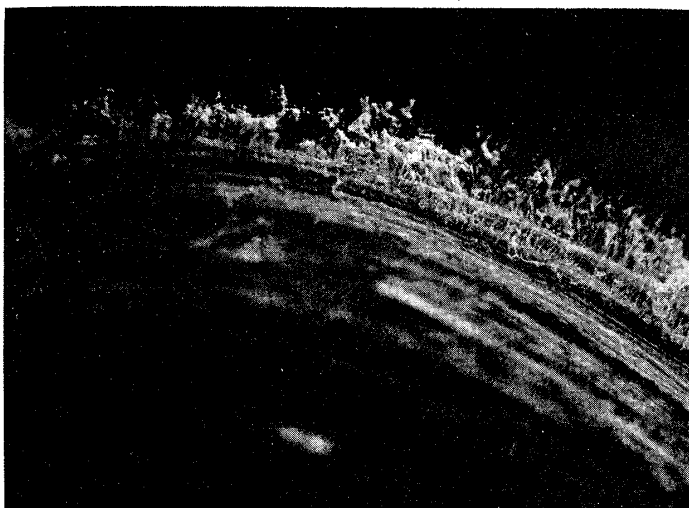


Fig. 1



Fig. 4



Fig. 2



Fig. 3

M. UYEMURA: ON THREE NEW *EPISTYLIS* FROM THE FRESH WATER MUSSEL